

What is claimed is:

1. An intaglio printing press, comprising:
  - an intaglio plate cylinder supported to be freely rotatable;
  - at least one inking unit which supplies ink to the intaglio plate cylinder;
  - an ink removing unit which removes surplus ink of the ink supplied to the intaglio plate cylinder; and
  - an ink recycling unit provided upstream of the ink removing unit with respect to a rotation direction of the intaglio plate cylinder and downstream of the inking unit, and adapted to remove ink before the ink is removed by the ink removing unit and return the removed ink to the inking unit.
2. The intaglio printing press according to claim 1, wherein the ink recycling unit includes precedence ink removing means which removes the ink from the intaglio plate cylinder, and ink returning means which returns the ink removed by the precedence ink removing means to the inking unit.
3. The intaglio printing press according to claim 2, wherein the ink returning means includes at least one pipe connected between the precedence ink removal means and the inking unit, and a pump which supplies the ink to the inking unit through the pipe.
4. The intaglio printing press according to claim 3, further comprising:
  - ink amount detecting means which detects an amount of the ink stored in the inking unit to control drive of the pump in accordance with a detected result by the ink amount detecting means.
5. The intaglio printing press according to claim 1, wherein the inking unit includes an ink supplying pattern roller which is in contact with the intaglio plate cylinder.

6. The intaglio printing press according to claim 2,

wherein the precedence ink removing means includes a pre-wiping pattern roller which is in contact with the intaglio plate cylinder, an ink transfer roller which transfers the ink on the pre-wiping pattern roller, and ink scraping means which scrapes the ink on the ink transfer roller.

7. The intaglio printing press according to claim 2, wherein the precedence ink removing means includes an ink transfer roller which transfers the ink on the intaglio plate cylinder, an ink scraping blade which is in contact with the ink transfer roller, and a recovery blade which recovers the scraped ink on the ink scraping blade.

8. The intaglio printing press according to claim 2, wherein the precedence ink removing means includes:

a pre-wiping pattern roller which is in contact with the intaglio plate cylinder and has at least one convexly patterned region corresponding to an area where desired ink is applied, in order to transfer the desired ink on the intaglio plate cylinder;

an ink transfer roller which is in contact with the pre-wiping pattern roller and adapted to transfer the ink transferred to the convexly patterned region of the pre-wiping roller;

an ink scraping blade which scrapes the ink on the ink transfer roller; and

a recovery blade which recovers the ink on the scraping blade, after being scraped by the ink scraping blade, into an ink recovery box.

9. The intaglio printing press according to claim 5, wherein the precedence ink removing means has a pre-wiping pattern roller which is in contact with the intaglio plate cylinder and has a diameter same as that of the ink supplying pattern roller.

10. The intaglio printing press according to claim 6, further comprising:  
a recovery blade supported to be freely movable and discharges the ink on the ink scraping means; and  
a recovery box which recovers the ink discharged by the recovery blade.
11. The intaglio printing press according to claim 10, wherein the recovery blade is adapted to move reciprocatingly in an approximate axis direction of the ink transfer roller, across a surface of the scraping means.
12. The intaglio printing press according to claim 10, further comprising:  
a cutter which blocks a flow of the ink scraped by the scraping means and is provided upstream of the recovery blade in a direction of the ink flow.
13. The intaglio printing press according to claim 12, wherein the recovery blade is supported to be freely movable between a discharge position where the ink is discharged and a standby position, moves from the standby position to the discharge position when the ink flow is blocked by the cutter and recovers the ink into the recovery box, and thereafter moves from the discharge position to the standby position.
14. The intaglio printing press according to claim 13, further comprising:  
scraped ink detecting means which detects the ink scraped by the scraping means and provided upstream of the cutter in a direction of the ink flow; and  
control means which controls the cutter and the recovery blade to be operated after a predetermined period of time which begins when the scraped ink detecting means detects the ink.
15. The intaglio printing press according to claim 14, wherein the control means controls the cutter and the recovery blade to be operated after a predetermined period of time after an ink recovery operation by the cutter

and the recovery blade is completed.

16. The intaglio printing press according to claim 3, further comprising:  
ink supply means which supplies new ink to the inking unit.

17. The intaglio printing press according to claim 1,  
wherein the inking units have a plurality of ink supplying pattern  
rollers which are in contact with the intaglio plate cylinder and have  
different supply patterned portions, respectively,

the precedence ink removing means has a pre-wiping pattern roller  
which is in contact with the intaglio plate cylinder, and

the pre-wiping pattern roller has at least one recovery patterned  
portion that is approximately the same as the supplying patterned portion of  
one of the ink supplying pattern rollers among the plurality of the ink  
supplying pattern rollers.

18. The intaglio printing press according to claim 17,  
wherein each of the patterned portions are formed on the plurality of  
the ink supplying pattern rollers in order to prevent the ink transferred from  
the respective patterned portions from overlapping on the intaglio plate  
cylinder, and

the pre-wiping pattern roller recovers only the ink supplied on the  
intaglio plate cylinder only by one of the ink supplying pattern rollers among  
the plurality of ink supplying pattern rollers.

19. The intaglio printing press according to claim 6, further comprising:  
heating means which heats the scraping means.